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ADVANCE

COPY

WATER QUALITY DATA FOR SELECTED SITES

Yellowstone-Tongue APO

Broadus, MT

May 1977

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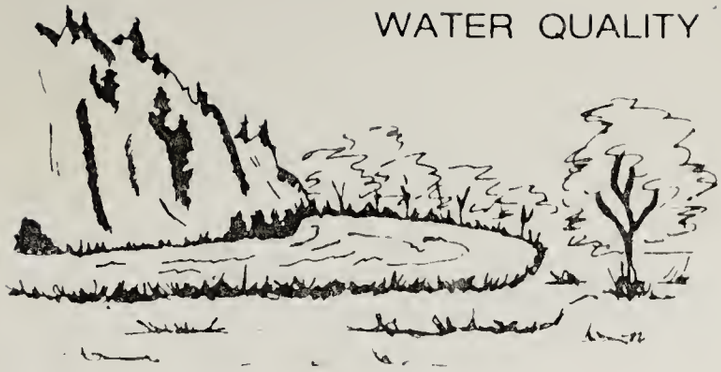
WATER QUALITY MANAGEMENT PROJECT



YELLOWSTONE-TONGUE A.P.O.
P. O. Box 503
Broadus, Montana 59317
406-436-2802 or 406-436-2816

CLARK JUDY, Director DOREL A. HUNT, Planner AMBREY GARTNER, E.I.T.

The attached material is a partial response to your request (the blue checklist) for water quality data. If you are interested in additional data, please call 436-2802 (collect) and we can discuss the types of printout you can utilize.

A large amount of water quality data is available from the STORET system and it can be printed out in several formats. As a result, we are reluctant to send out computer printout unless we know the specific site, time period, or parameters you are interested in. Also, in a few weeks we will obtain data that is more recent than that enclosed.

Advance Copy

APPENDIX XXX

WATER QUALITY DATA FOR SELECTED SITES

(As of June 1976)

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WATER QUALITY DATA FOR SELECTED SITES

The YTAPO has utilized existing water quality data whenever possible. MOst of the existing data has been collected by the U.S.G.S. and is available in the form of computer printouts from the EPA's STORET system.

Some of this data is reproduced on the following pages. Detailed STORET printouts are available upon request. The data can be printed out in a summary form, as on the folowing pages, or it can be printed out on a sample by sample basis. Call our office (436-2802) of the EPA in Denver (303-837-2226) if you need additional data.

The final "208 Plan" will include a summary of water quality data similar to that on the next few pages as well as interpretative graphs, etc. Complete copies of the computer printout will only be distributed upon special request.

WAter quality data collected by the ~~Satae~~ State of MOntana and by the YTAPO is available for several streams. This information will also be available upon special request.

This report was financed by a
Section 208 Areawide Waste
Treatment Management Planning
Grant from the U.S. EPA.

06296120
46 23 51.0 105 53 36.0 2
YELLOWSTONE RIVER NEAR MILES CIT
30017 MONTANA

090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
WATER	TEMP	CENT	89	9.76965	25.0000	.000000
AIR	TEMP	CENT	42	13.3451	36.0000	-.179E+02
COLLECT	AGENCY	CODE	11	1028.00	1028.00	1028.00
STREAM	FLOW	CFS	174	14410.9	60099.9	3549.99
STREAM	FLOW,	INST-CFS	49	15494.9	66000.0	3399.99
TURB	JKSN	JTU	45	88.2444	800.000	2.00000
COLOR	PT-CO	UNITS	62	5.85478	15.0000	1.000000
CNDUCTVY	AT 25C	MICROMHO	199	609.656	969.000	245.000
DO		MG/L	44	10.2408	13.8000	7.39999
DO	SATUR	PERCENT	44	96.2112	117.000	65.9999
BOD	5 DAY	MG/L	21	2.25713	7.89999	.500000
COD	HI LEVEL	MG/L	45	19.9778	96.0000	5.00000
PH		SU	190	7.91622	8.70000	6.80000
CO2		MG/L	65	3.39692	13.0000	.500000
T ALK	CACO3	MG/L	181	139.618	199.000	68.0000
HCO3 ION	HCO3	MG/L	176	168.976	243.000	83.0000
CO3 ION	CO3	MG/L	160	.581250	41.0000	.000000
BIOMASS	PERPHYTN	G/SQ M	1	3.80000	3.80000	3.80000
BIOMASS	PERPHYTN	DW G/M2	1	7.40000	7.40000	7.40000
TOTAL N	N	MG/L	45	1.22466	15.0000	.330000
ORG N	N	MG/L	45	.624664	2.90000	.160000
NH3-N	TOTAL	MG/L	45	.078222	.410000	.000000
NO3-N	DISS	MG/L	47	.094042	.500000	.000000
TOT KJEL	N	MG/L	45	.700440	3.00000	.190000
NO2&NO3	N-TOTAL	MG/L	45	.516885	14.0000	.000000
NO2&NO3	N-DISS	MG/L	104	.199229	1.10000	.000000
ORTHOPO4	PO4	MG/L	104	.033269	.150000	.000000
PHOS-TOT		MG/L P	45	.201777	1.60000	.000000
PHOS-DIS		MG/L P	55	.031273	.120000	.000000
PHOS-DIS	ORTHO	MG/L P	76	.009868	.040000	.000000
T ORG C	C	MG/L	42	7.16664	16.0000	1.40000
D ORG C	C	MG/L	2	6.90000	8.40000	5.40000
S ORG C	C	MG/L	1	.100000	.100000	.100000
TOT HARD	CACO3	MG/L	176	203.579	330.000	86.0000
NC HARD	CACO3	MG/L	176	64.1930	130.000	9.00000
CALCIUM	CA,DISS	MG/L	174	51.1895	82.0000	23.0000
MGNSIUM	MG,DISS	MG/L	174	18.4390	31.0000	7.00000
SODIUM	NA,DISS	MG/L	176	50.9374	93.0000	15.0000
SODIUM	ADSBTION	RATIO	176	1.52272	2.40000	.700000

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https://archive.org/details/waterqualitydata1977yell

			NUMBER	MEAN	MAXIMUM	MINIMUM
PERCENT	SODIUM	%	176	34.0283	41.0000	24.0000
PTSSIUM	K,DISS	MG/L	174	3.52234	5.80000	1.40000
CHLORIDE	CL	MG/L	174	7.85107	14.0000	2.80000
SULFATE	SO4-TOT	MG/L	175	163.811	304.000	46.0000
FLUORIDE	F,DISS	MG/L	174	.417812	.900000	.000000
SILICA	DISOLVED	MG/L	174	11.4235	18.0000	3.80000
ARSENIC	AS,DISS	UG/L	3	4.00000	6.00000	1.00000
ARSENIC	AS,TOT	UG/L	4	10.2500	16.0000	6.00000
BERYLIUM	BE,DISS	UG/L	3	3.33333	10.0000	.000000
BERYLIUM	BE,TOT	UG/L	2	.000000	.000000	.000000
BORON	B,DISS	UG/L	83	140.649	226.000	16.0000
CADMIUM	CD,DISS	UG/L	3	.000000	.000000	.000000
CADMIUM	CD,TOT	UG/L	3	10.0000	10.0000	10.0000
CHROMIUM	CR,DISS	UG/L	3	3.33333	10.0000	.000000
CHROMIUM	CR,TOT	UG/L	3	10.0000	20.0000	.000000
COPPER	CU,DISS	UG/L	3	1.33333	2.00000	.000000
COPPER	CU,TOT	UG/L	5	44.0000	100.000	10.0000
IRON	FE,TOT	UG/L	7	4334.31	11000.0	.200000
IRON	FE,DISS	UG/L	116	67.3620	1800.00	.000000
LEAD	PB,DISS	UG/L	3	1.33333	2.00000	1.00000
LEAD	PB,TOT	UG/L	5	100.000	100.000	100.000
MANGNESE	MN	UG/L	4	167.500	290.000	50.0000
MANGNESE	MN,DISS	UG/L	100	9.32000	130.000	.000000
MOLY	MO,DISS	UG/L	3	2.00000	3.00000	1.00000
MOLY	MO,TOT	UG/L	3	2.66667	4.00000	1.00000
NICKEL	NI,DISS	UG/L	3	3.66667	6.00000	2.00000
NICKEL	NI,TOTAL	UG/L	3	33.3333	50.0000	.000000
VANADIUM	V,DISS	UG/L	3	1.70000	2.00000	1.10000
ZINC	ZN,DISS	UG/L	3	6.66667	20.0000	.000000
ZINC	ZN,TOT	UG/L	5	64.0000	100.000	30.0000
ALUMINUM	AL,TOT	UG/L	3	4366.66	9000.00	1900.00
ALUMINUM	AL,DISS	UG/L	3	16.6667	30.0000	10.0000
LITHIUM	LI,DISS	UG/L	3	33.3333	50.0000	10.0000
LITHIUM	LI,TOT	UG/L	3	33.3333	50.0000	10.0000
SELENIUM	SE,DISS	UG/L	3	1.33333	2.00000	1.00000
SELENIUM	SE,TOT	UG/L	5	1.40000	2.00000	1.00000
TOT COLI	MFIMENDO	/100ML	37	2568.70	45999.9	.999999
FEC COLI	MFM-FCBR	/100ML	38	243.945	2100.00	.000000
CHL B	PERIPHTN	MG/M2	1	.100000	.100000	.100000
CHL A	PERIPHTN	MG/M2	1	1.50000	1.50000	1.50000
ALGAE	TOTAL	/ML	7	5671.42	10000.0	1000.00
RES-SUSP	AT 180 C	MG/L	45	218.133	2020.00	.000000
RESIDUE	DISS-180	C MG/L	105	417.541	672.000	157.000
DISS SOL	SUM	MG/L	173	392.045	627.000	150.000
DISS SOL	TONS/DAY		193	13521.9	57700.0	5760.00
DISS SOL	TONS PER	ACRE-FT	195	.542814	.910000	.200000
PHOS-T	ORTHO	MG/L P	26	.012308	.040000	.000000
NITRATE	DISS-NO3	MG/L	62	.567737	2.90000	.000000
TOTAL N	AS NO3	MG/L	45	5.39999	65.0000	1.50000
MERCURY	HG,DISS	UG/L	3	.100000	.200000	.000000
MERCURY	HG,TOTAL	UG/L	4	.350000	1.00000	.100000

06326500
46 27 00.0 105 19 00.0 2
POWDER RIVER NEAR LOCATE, MT.
30017 MONTANA

090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
WATER	TEMP	CENT	6	9.61667	22.2000	.000000
AIR	TEMP	CENT	4	15.0000	23.0000	.000000
STREAM	FLOW	CFS	99	840.136	11470.0	.200000
STREAM	FLOW,	INST-CFS	4	198.250	350.000	33.0000
TURB	JKSN	JTU	5	1239.60	5800.00	4.00000
COLOR	PT-CO	UNITS	15	34.3334	200.000	7.00000
CNDUCTVY	AT 25C	MICROMHO	104	2030.47	4200.00	338.000
DO		MG/L	5	11.1000	12.5000	8.00000
DO	SATUR	PERCENT	5	98.4000	104.000	94.0000
PH		SU	104	7.72590	8.50000	6.90000
CO2		MG/L	5	2.42000	4.40000	1.50000
T ALK	CACO3	MG/L	6	234.500	283.000	212.000
HCO3 ION	HCO3	MG/L	103	262.835	915.000	128.000
CO3 ION	CO3	MG/L	103	.271845	18.0000	.000000
BIOMASS	PERPHYTN	G/SQ M	2	3.10000	6.20000	.000000
BIOMASS	PERPHYTN	DW G/M2	2	4.20000	8.40000	.000000
TOTAL N	N	MG/L	5	.862000	1.30000	.470000
TOT KJEL	N	MG/L	5	.720000	1.00000	.460000
NO2&NO3	N-TOTAL	MG/L	5	.134000	.340000	.000000
PHOS-TOT		MG/L P	5	.312000	.720001	.010000
T ORG C	C	MG/L	1	20.0000	20.0000	20.0000
TOT HARD	CACO3	MG/L	104	562.317	1600.00	47.0000
NC HARD	CACO3	MG/L	104	454.346	1330.00	.499E-06
CALCIUM	CA,DISS	MG/L	25	150.540	411.000	9.50000
MGNSIUM	MG,DISS	MG/L	25	55.6400	140.000	6.20000
SODIUM	NA,DISS	MG/L	103	237.767	525.000	14.0000
SODIUM	ADSRTION	RATIO	103	4.16888	25.0000	.600000
PERCENT	SODIUM	%	6	51.0000	57.0000	45.0000
PTSSIUM	K,DISS	MG/L	20	8.82000	25.0000	3.60000
CHLORIDE	CL	MG/L	21	73.2286	220.000	.600000
SULFATE	SO4-TOT	MG/L	84	883.428	2110.00	33.0000
FLUORIDE	F,DISS	MG/L	20	.405000	.600000	.300000
SILICA	DISOLVED	MG/L	20	10.2500	18.0000	5.80000
ARSENIC	AS,DISS	UG/L	1	1.00000	1.00000	1.00000
ARSENIC	AS,SUSP	UG/L	1	11.0000	11.0000	11.0000
ARSENIC	AS,TOT	UG/L	1	12.0000	12.0000	12.0000
BORON	B,DISS	UG/L	15	271.333	1160.00	70.0000
CADMIUM	CD,DISS	UG/L	1	1.00000	1.00000	1.00000
CADMIUM	CD,SUSP	UG/L	1	9.00000	9.00000	9.00000

			NUMBER	MEAN	MAXIMUM	MINIMUM
CADMIUM	CD,TOT	UG/L	1	10.0000	10.0000	10.0000
CHROMIUM	CR,DISS	UG/L	1	10.0000	10.0000	10.0000
CHROMIUM	CR,SUSP	UG/L	1	30.0000	30.0000	30.0000
CHROMIUM	CR,TOT	UG/L	1	40.0000	40.0000	40.0000
COBALT	CO,DISS	UG/L	1	.000000	.000000	.000000
COBALT	CO,SUSP	UG/L	1	50.0000	50.0000	50.0000
COBALT	CO,TOTAL	UG/L	1	50.0000	50.0000	50.0000
COPPER	CU,DISS	UG/L	1	7.00000	7.00000	7.00000
COPPER	CU,SUSP	UG/L	1	43.0000	43.0000	43.0000
COPPER	CU,TOT	UG/L	1	50.0000	50.0000	50.0000
IRON	FE,TOT	UG/L	1	28000.0	28000.0	28000.0
IRON	FE,DISS	UG/L	1	20.0000	20.0000	20.0000
LEAD	PB,DISS	UG/L	1	4.00000	4.00000	4.00000
LEAD	PB,SUSP	UG/L	1	200.000	200.000	200.000
LEAD	PB,TOT	UG/L	1	200.000	200.000	200.000
MANGNESE	MN,SUSP	UG/L	1	600.000	600.000	600.000
MANGNESE	MN	UG/L	1	600.000	600.000	600.000
MANGNESE	MN,DISS	UG/L	1	5.00000	5.00000	5.00000
ZINC	ZN,DISS	UG/L	1	20.0000	20.0000	20.0000
ZINC	ZN,SUSP	UG/L	1	130.000	130.000	130.000
ZINC	ZN,TOT	UG/L	1	150.000	150.000	150.000
SELENIUM	SE,DISS	UG/L	1	2.00000	2.00000	2.00000
SELENIUM	SE,SUSP	UG/L	1	.000000	.000000	.000000
SELENIUM	SE,TOT	UG/L	1	2.00000	2.00000	2.00000
FEC COLI	MFM-FCBR	/100ML	2	65.9999	70.9999	60.9999
FECSTREP	MFKFAGAR	/100ML	2	93.9999	110.000	77.9999
CHL B	PERIPHTN	MG/M2	2	.000000	.000000	.000000
CHL A	PERIPHTN	MG/M2	2	.100000	.200000	.000000
ALGAE	TOTAL	/ML	3	18300.0	37000.0	4900.00
RESIDUE	DISS-180 C	MG/L	102	1638.23	3780.00	322.000
DISS SOL	SUM	MG/L	5	1508.00	1760.00	1250.00
DISS SOL	TONS/DAY		101	2125.24	30110.0	1.13000
DISS SOL	TONS PER	ACRE-FT	102	2.22764	5.14000	.440000
SUSP SED	PARTSIZE	%<.004MM	1	36.0000	36.0000	36.0000
SUSP SED	PARTSIZE	%<.016MM	1	60.0000	60.0000	60.0000
SUSP SED	PARTSIZE	%<.062MM	1	92.0000	92.0000	92.0000
SUSP SED	PARTSIZE	%<.125MM	1	97.0000	97.0000	97.0000
SUSP SED	PARTSIZE	%<.250MM	1	100.000	100.000	100.000
NITRATE	DISS-NO3	MG/L	15	2.13333	7.80000	.100000
IRON	FE	UG/L	15	20.6667	80.0000	.499E-06
TOTAL N	AS NO3	MG/L	5	3.78000	5.80000	2.10000
MERCURY	HG,DISS	UG/L	1	.000000	.000000	.000000
MERCURY	HG,SUSP	UG/L	1	.200000	.200000	.200000
MERCURY	HG,TOTAL	UG/L	1	.200000	.200000	.200000
SUSP SED	CONC	MG/L	1	32600.0	32600.0	32600.0
SUSP SED	DISCHARG	TONS/DAY	1	748000	748000	748000

06308500
46 21 30.0 105 48 24.0 2
TONGUE RIVER AT MILES CITY, MT.
30017 MONTANA
090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
WATER	TEMP	CENT	83	10.3084	29.4400	.000000
AIR	TEMP	CENT	21	14.7857	30.5000	.000000
STREAM	FLOW	CFS	277	597.370	4139.00	16.2000
STREAM	FLOW,	INST-CFS	27	611.296	4140.00	106.000
TURB	JKSN	JTU	16	153.750	1200.00	1.00000
COLOR	PT-CO	UNITS	42	7.85710	29.0000	2.00000
CNDUCTVY	AT 25C	MICROMHO	285	829.937	1540.00	327.000
DO		MG/L	23	10.2130	13.2000	6.50000
DO	SATUR	PERCENT	23	96.9391	110.000	79.0000
BOD	5 DAY	MG/L	13	1.99230	5.49999	.599999
PH		SU	285	7.93534	8.80000	6.90000
CO2		MG/L	41	4.08048	26.0000	1.10000
T ALK	CACO3	MG/L	203	227.387	367.000	111.000
HCO3 ION	HCO3	MG/L	284	271.196	448.000	126.000
CO3 ION	CO3	MG/L	277	.667871	22.0000	.000000
BIOMASS	PERPHYTN	G/SQ M	3	4.16667	12.0000	.100000
BIOMASS	PERPHYTN	DW G/M2	3	4.63333	13.0000	.400000
TOTAL N	N	MG/L	23	1.02608	4.19999	.290000
ORG N	N	MG/L	9	.884444	4.19999	.000000
NH3-N	DISS	MG/L	1	.010000	.010000	.010000
NH3-N	TOTAL	MG/L	8	.075000	.140000	.000000
NO2-N	DISS	MG/L	1	.000000	.000000	.000000
NO3-N	DISS	MG/L	14	.035000	.100000	.000000
TOT KJEL	N	MG/L	23	.944780	4.19999	.190000
NO2&NO3	N-TOTAL	MG/L	23	.086956	.320000	.000000
NO2&NO3	N-DISS	MG/L	46	.116956	.970000	.000000
ORTHOPO4	PO4	MG/L	46	.037826	.370000	.000000
PHOS-TOT		MG/L P	24	.176666	1.00000	.000000
PHOS-DIS		MG/L P	1	.030000	.030000	.030000
PHOS-DIS	ORTHO	MG/L P	32	.009062	.050000	.000000
T ORG C	C	MG/L	5	16.5000	27.0000	6.80000
TOT HARD	CACO3	MG/L	284	326.188	568.000	104.000
NC HARD	CACO3	MG/L	284	102.419	210.000	.499E-06
CALCIUM	CA,DISS	MG/L	111	63.2972	100.000	24.0000
MGNSIUM	MG,DISS	MG/L	111	43.9189	77.0000	11.0000
SODIUM	NA,DISS	MG/L	285	62.3681	154.000	13.0000
SODIUM	ADSRTION	RATIO	284	1.48764	3.40000	.500000
PERCENT	SODIUM	%	203	29.0147	49.0000	20.0000
PTSSIUM	K,DISS	MG/L	111	5.08193	9.90000	1.90000

			NUMBER	MEAN	MAXIMUM	MINIMUM
CHLORIDE	CL	MG/L	110	4.34177	12.0000	.800000
SULFATE	SO4-TOT	MG/L	283	226.017	508.000	50.0000
FLUORIDE	F,DISS	MG/L	110	.359995	.800000	.200000
FLUORIDE	F,TOTAL	MG/L	2	.449999	.599999	.300000
SILICA	DISOLVED	MG/L	111	7.22605	17.0000	.599999
ARSENIC	AS,DISS	UG/L	6	.333333	1.00000	.000000
ARSENIC	AS,SUSP	UG/L	5	10.0000	26.0000	1.00000
ARSENIC	AS,TOT	UG/L	6	8.83333	26.0000	1.00000
BARIUM	BA,DISS	UG/L	1	90.0000	90.0000	90.0000
BERYLIUM	BE,DISS	UG/L	1	10.0000	10.0000	10.0000
BERYLIUM	BE,TOT	UG/L	1	10.0000	10.0000	10.0000
BISMUTH	BI,DISS	UG/L	1	10.0000	10.0000	10.0000
BORON	B,DISS	UG/L	62	133.467	1250.00	10.0000
BORON	B,TOT	UG/L	2	165.000	240.000	89.9999
CADMIUM	CD,DISS	UG/L	6	.333333	1.00000	.000000
CADMIUM	CD,SUSP	UG/L	5	9.80000	19.0000	.000000
CADMIUM	CD,TOT	UG/L	6	10.0000	20.0000	.000000
CHROMIUM	CR,DISS	UG/L	6	1.66667	10.0000	.000000
CHROMIUM	CR,SUSP	UG/L	5	40.0000	80.0000	.000000
CHROMIUM	CR,TOT	UG/L	6	35.0000	80.0000	.000000
COBALT	CO,DISS	UG/L	6	1.83333	10.0000	.000000
COBALT	CO,SUSP	UG/L	5	59.8000	100.000	49.0000
COBALT	CO,TOTAL	UG/L	5	60.0000	100.000	50.0000
COPPER	CU,DISS	UG/L	6	3.83333	7.00000	1.00000
COPPER	CU,SUSP	UG/L	5	59.2000	160.000	9.00000
COPPER	CU,TOT	UG/L	8	53.7500	170.000	10.0000
IRON	FE,TOT	UG/L	10	12450.0	74000.0	10.00000
IRON	FE,DISS	UG/L	67	51.7313	255.000	.000000
LEAD	PB,DISS	UG/L	6	3.00000	5.00000	1.00000
LEAD	PB,SUSP	UG/L	5	78.0000	99.0000	.000000
LEAD	PB,TOT	UG/L	8	76.2500	100.000	.000000
MANGNESE	MN,SUSP	UG/L	4	230.000	680.000	30.0000
MANGNESE	MN	UG/L	5	196.000	680.000	30.0000
MANGNESE	MN,DISS	UG/L	51	12.6078	100.000	.000000
MOLY	MO,DISS	UG/L	1	.000000	.000000	.000000
MOLY	MO,TOT	UG/L	1	3.00000	3.00000	3.00000
NICKEL	NI,DISS	UG/L	1	1.00000	1.00000	1.00000
NICKEL	NI,TOTAL	UG/L	1	50.0000	50.0000	50.0000
SILVER	AG,DISS	UG/L	1	1.00000	1.00000	1.00000
STRONTUM	SR,DISS	UG/L	1	860.000	860.000	860.000

			NUMBER	MEAN	MAXIMUM	MINIMUM
VANADIUM	V,DISS	UG/L	1	.500000	.500000	.500000
ZINC	ZN,DISS	UG/L	6	13.3333	20.0000	10.0000
ZINC	ZN,SUSP	UG/L	5	130.000	330.000	20.0000
ZINC	ZN,TOT	UG/L	8	107.500	340.000	30.0000
TIN	SN,DISS	UG/L	1	10.0000	10.0000	10.0000
ALUMINUM	AL,TOT	UG/L	3	1616.66	3899.99	350.000
ALUMINUM	AL,DISS	UG/L	1	20.0000	20.0000	20.0000
GALLIUM	GA,DISS	UG/L	1	6.00000	6.00000	6.00000
GERMANUM	GE,DISS	UG/L	1	10.0000	10.0000	10.0000
LITHIUM	LI,DISS	UG/L	1	30.0000	30.0000	30.0000
LITHIUM	LI,TOT	UG/L	1	20.0000	20.0000	20.0000
SELENIUM	SE,DISS	UG/L	6	.333333	1.00000	.000000
SELENIUM	SE,SUSP	UG/L	5	.800000	1.00000	.000000
SELENIUM	SE,TOT	UG/L	8	1.12500	3.00000	.000000
TITANIUM	TI,DISS	UG/L	1	10.0000	10.0000	10.0000
ZIRCONUM	ZR,DISS	UG/L	1	10.0000	10.0000	10.0000
TOT COLI	MFIMENDO	/100ML	2	123.500	230.000	17.0000
FEC COLI	MFM-FCBR	/100ML	11	301.635	2800.00	4.00000
FECSTREP	MFKFAGAR	/100ML	11	542.361	3399.99	16.0000
CHL B	PERIPHTN	MG/M2	3	.066667	.200000	.000000
CHL A	PERIPHTN	MG/M2	3	.166667	.300000	.100000
ALGAE	TOTAL	/ML	10	6509.00	20000.0	260.000
RES-SUSP	AT 180 C	MG/L	7	126.571	389.999	7.00000
RESIDUE	DISS-180	C MG/L	238	559.344	1080.00	216.000
DISS SOL	SUM	MG/L	82	559.804	912.000	215.000
DISS SOL	TONS/DAY		282	672.057	3580.00	39.9000
DISS SOL	TONS PER	ACRE-FT	284	.761578	1.47000	.290000
PHOS-T	ORTHO	MG/L P	11	.021818	.120000	.000000
AMMONIA	DISS-NH4	MG/L	26	1.98846	2.90000	1.20000
NITRATE	DISS-NO3	MG/L	49	.289796	1.40000	.000000
NITRITE	DISS-NO2	MG/L	22	6.04545	9.00000	1.00000
BROMIDE	BR	MG/L	52	.272119	.480000	.150000
IRON	FE	UG/L	17	27.0588	190.000	.499E-06
TOTAL N	AS NO3	MG/L	23	4.60434	19.0000	1.30000
MERCURY	HG,DISS	UG/L	6	.033333	.200000	.000000
MERCURY	HG,SUSP	UG/L	5	.020000	.100000	.000000
MERCURY	HG,TOTAL	UG/L	8	.137500	.799999	.000000

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ROSEBUD CREEK AT MOUTH, NEAR ROS
30087 MONTANA

090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
LAB	IDENT.	NUMBER	1	751823	751823	751823
WATER	TEMP	CENT	17	6.91176	25.0000	.000000
AIR	TEMP	CENT	13	11.0000	29.0000	-.499E+01
STREAM	FLOW,	INST-CFS	17	118.438	905.000	13.1000
TURB	JKSN	JTU	17	297.353	2500.00	5.00000
CNDUCTVY	AT 25C	MICROMHO	17	1202.94	2060.00	330.000
DO		MG/L	17	17.0470	124.000	6.20000
DO	SATUR	PERCENT	17	91.7058	103.000	67.0000
BOD	5 DAY	MG/L	13	2.95384	8.79999	1.10000
PH		SU	17	8.11764	8.50000	7.50000
CO2		MG/L	17	6.47646	18.0000	2.10000
T ALK	CACO3	MG/L	17	356.412	522.000	109.000
HCO3 ION	HCO3	MG/L	17	426.706	636.000	133.000
CO3 ION	CO3	MG/L	17	3.82353	21.0000	.000000
RESIDUE	DISS-105	C MG/L	1	1100.00	1100.00	1100.00
RESIDUE	TOT NFLT	MG/L	1	97.0000	97.0000	97.0000
TOTAL N	N	MG/L	17	1.45058	6.20000	.290000
ORG N	N	MG/L	17	1.27176	5.70000	.220000
NH3-N	TOTAL	MG/L	17	.054706	.180000	.000000
TOT KJEL	N	MG/L	17	1.32235	5.70000	.260000
NO2&NO3	N-TOTAL	MG/L	17	.119411	.450000	.010000
PHOS-TOT		MG/L P	17	.321764	2.30000	.020000
TOT HARD	CACO3	MG/L	17	498.823	770.000	110.000
NC HARD	CACO3	MG/L	17	143.412	280.000	.000000
CALCIUM	CA,DISS	MG/L	17	69.7647	110.000	25.0000
MGNSIUM	MG,DISS	MG/L	17	78.4706	120.000	12.0000
SODIUM	NA,DISS	MG/L	17	89.8235	140.000	24.0000
SODIUM	ADSRTION	RATIO	17	1.81176	3.80000	.900000
PERCENT	SODIUM	%	17	28.7647	63.0000	19.0000
PTSSIUM	K,DISS	MG/L	17	9.50000	12.0000	5.00000
CHLORIDE	CL	MG/L	17	5.19999	7.60000	2.80000
SULFATE	SO4-TOT	MG/L	17	321.059	530.000	68.0000
FLUORIDE	F,DISS	MG/L	17	.535294	.700000	.200000
SILICA	DISOLVED	MG/L	17	13.7118	21.0000	7.50000
ARSENIC	AS,DISS	UG/L	3	1.33333	3.00000	.000000
ARSENIC	AS,TOT	UG/L	9	3.66667	10.0000	.000000
BARIUM	BA,DISS	UG/L	2	80.0000	90.0000	70.0000
BERYLIUM	BE,DISS	UG/L	2	9.99999	10.0000	9.99999
BERYLIUM	BE,TOT	UG/L	9	7.77778	10.0000	.000000

			NUMBER	MEAN	MAXIMUM	MINIMUM
BISMUTH	BI,DISS	UG/L	2	23.5000	40.0000	7.00000
BORON	B,DISS	UG/L	17	171.765	230.000	100.000
CADMIUM	CD,DISS	UG/L	2	.000000	.000000	.000000
CADMIUM	CD,TOT	UG/L	9	10.0000	20.0000	.000000
CHROMIUM	CR,DISS	UG/L	2	9.99999	10.0000	9.99999
CHROMIUM	CR,TOT	UG/L	9	14.5556	40.0000	.000000
COBALT	CO,DISS	UG/L	2	13.5000	20.0000	7.00000
COPPER	CU,DISS	UG/L	2	1.00000	2.00000	.000000
COPPER	CU,TOT	UG/L	9	23.3333	60.0000	10.0000
IRON	FE,TOT	UG/L	9	7677.77	31999.9	1000.00
IRON	FE,DISS	UG/L	17	48.2353	140.000	.000000
LEAD	PB,DISS	UG/L	2	.500000	1.00000	.000000
LEAD	PB,TOT	UG/L	9	100.000	100.000	100.000
MANGNESE	MN	UG/L	9	184.444	570.000	60.0000
MANGNESE	MN,DISS	UG/L	2	30.0000	30.0000	30.0000
MOLY	MO,DISS	UG/L	2	2.50000	3.00000	2.00000
MOLY	MO,TOT	UG/L	9	1.88889	3.00000	.000000
NICKEL	NI,DISS	UG/L	2	1.50000	3.00000	.000000
NICKEL	NI,TOTAL	UG/L	9	55.5555	100.000	.000000
SILVER	AG,DISS	UG/L	2	1.00000	2.00000	.000000
STRONTUM	SR,DISS	UG/L	2	1300.00	1500.00	1100.00
VANADIUM	V,DISS	UG/L	2	2.80000	4.00000	1.60000
ZINC	ZN,DISS	UG/L	2	10.0000	20.0000	.000000
ZINC	ZN,TOT	UG/L	4	25.0000	40.0000	10.0000
TIN	SN,DISS	UG/L	2	13.5000	20.0000	7.00000
ALUMINUM	AL,TOT	UG/L	4	1952.50	4300.00	710.000
ALUMINUM	AL,DISS	UG/L was this used?	2	.000000	.000000	.000000
GALLIUM	GA,DISS	UG/L	2	6.00000	8.00000	4.00000
GERMANUM	GE,DISS	UG/L	2	23.5000	40.0000	7.00000
LITHIUM	LI,DISS	UG/L	2	48.0000	56.0000	40.0000
LITHIUM	LI,TOT	UG/L	9	42.2222	60.0000	30.0000
SELENIUM	SE,DISS	UG/L	1	1.00000	1.00000	1.00000
SELENIUM	SE,TOT	UG/L	9	.444444	1.00000	.000000
TITANIUM	TI,DISS	UG/L	2	7.50000	10.0000	5.00000
ZIRCONUM	ZR,DISS	UG/L	2	22.5000	30.0000	15.0000
BETA-D	AS CS137	PC/L	1	15.0000	15.0000	15.0000
BETA-S	AS CS137	PC/L	1	4.60000	4.60000	4.60000
RA-226-D	RADON MT	PC/L	1	.110000	.110000	.110000
U-NAT	DISOLVED	UG/L	1	4.60000	4.60000	4.60000
DISS SOL	SUM	MG/L	17	802.235	1210.00	220.000
DISS SOL	TONS/DAY		17	171.441	924.000	32.8000
DISS SOL	TONS PER	ACRE-FT	17	1.09000	1.65000	.300000
TOTAL N	AS NO3	MG/L	17	6.38235	27.0000	1.30000
MERCURY	HG,DISS	UG/L	2	.050000	.100000	.000000
MERCURY	HG,TOTAL	UG/L	9	.255555	1.20000	.000000
ALPHA-D	AS U-NAT	UG/L	1	18.0000	18.0000	18.0000
ALPHA-S	AS U-NAT	UG/L	1	4.10000	4.10000	4.10000
BETA-D	AS SR-Y-	90, PC/L	1	12.0000	12.0000	12.0000
BETA-S	AS SR-Y-	90, PC/L	1	3.70000	3.70000	3.70000

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ARMELLS CREEK NEAR FORSYTH, MT.
30087 MONTANA
090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
LAB	IDENT.	NUMBER	1	751821	751821	751821
WATER	TEMP	CENT	16	7.81250	25.0000	.000000
AIR	TEMP	CENT	13	12.0769	26.0000	-.899E+01
STREAM	FLOW,	INST-CFS	16	36.1799	462.000	.050000
TURB	JKSN	JTU	16	77.1875	400.000	1.00000
CNDUCTVY	AT 25C	MICROMHO	16	3578.44	6500.00	395.000
DO		MG/L	16	10.1937	13.2000	7.00000
DO	SATUR	PERCENT	16	91.6937	120.000	69.1000
BOD	5 DAY	MG/L	13	3.41538	9.89999	.899999
PH		SU	16	8.14374	8.69999	7.40000
CO2		MG/L	16	6.89999	16.0000	2.00000
T ALK	CACO3	MG/L	16	440.750	749.000	73.0000
HCO3 ION	HCO3	MG/L	16	528.187	913.000	89.0000
CO3 ION	CO3	MG/L	16	4.56250	36.0000	.000000
RESIDUE	DISS-105	C MG/L	1	2800.00	2800.00	2800.00
RESIDUE	TOT NFLT	MG/L	1	23.0000	23.0000	23.0000
TOTAL N	N	MG/L	16	1.13062	2.20000	.410000
ORG N	N	MG/L	16	.997500	2.00000	.310000
NH3-N	TOTAL	MG/L	16	.059375	.160000	.000000
TOT KJEL	N	MG/L	16	1.05312	2.10000	.340000
NO2&NO3	N-TOTAL	MG/L	16	.078125	.230000	.000000
PHOS-TOT		MG/L P	16	.118750	.510000	.010000
TOT HARD	CACO3	MG/L	16	718.125	1300.00	110.000
NC HARD	CACO3	MG/L	16	296.687	810.000	.000000
CALCIUM	CA,DISS	MG/L	16	105.750	210.000	24.0000
MGNSIUM	MG,DISS	MG/L	16	109.875	210.000	12.0000
SODIUM	NA,DISS	MG/L	16	631.187	1000.00	35.0000
SODIUM	ADSBTION	RATIO	16	10.2875	17.0000	1.50000
PERCENT	SODIUM	%	16	63.1250	80.0000	36.0000
PTSSIUM	K,DISS	MG/L	16	10.1312	12.0000	6.50000
CHLORIDE	CL	MG/L	16	21.2000	39.0000	4.70000
SULFATE	SO4-TOT	MG/L	16	1585.62	2500.00	110.000
FLUORIDE	F,DISS	MG/L	16	.387500	.600000	.100000
SILICA	DISOLVED	MG/L	16	7.08125	14.0000	1.20000
ARSENIC	AS,DISS	UG/L	2	1.50000	2.00000	1.00000
ARSENIC	AS,TOT	UG/L	8	1.75000	5.00000	.000000
BARIUM	BA,DISS	UG/L	2	91.0000	100.000	82.0000
BERYLIUM	BE,DISS	UG/L	2	4.99999	9.99999	.000000
BERYLIUM	BE,TOT	UG/L	8	7.50000	10.0000	.000000

			NUMBER	MEAN	MAXIMUM	MINIMUM
BISMUTH	BI,DISS	UG/L	2	23.5000	30.0000	17.0000
BORON	B,DISS	UG/L	16	415.625	600.000	140.000
CADMIUM	CD,DISS	UG/L	2	.000000	.000000	.000000
CADMIUM	CD,TOT	UG/L	8	12.5000	20.0000	10.0000
CHROMIUM	CR,DISS	UG/L	2	9.99999	10.0000	9.99999
CHROMIUM	CR,TOT	UG/L	8	9.25000	64.0000	.000000
COBALT	CO,DISS	UG/L	2	18.5000	20.0000	17.0000
COPPER	CU,DISS	UG/L	2	2.00000	3.00000	1.00000
COPPER	CU,TOT	UG/L	8	67.5000	300.000	10.0000
IRON	FE,TOT	UG/L	8	1882.50	9700.00	250.000
IRON	FE,DISS	UG/L	16	84.3750	510.000	.000000
LEAD	PB,DISS	UG/L	2	1.50000	3.00000	.000000
LEAD	PB,TOT	UG/L	8	100.000	100.000	100.000
MANGNESE	MN	UG/L	8	141.250	270.000	30.0000
MANGNESE	MN,DISS	UG/L	2	135.000	210.000	60.0000
MOLY	MO,DISS	UG/L	2	4.00000	6.00000	2.00000
MOLY	MO,TOT	UG/L	8	2.25000	5.00000	.000000
NICKEL	NI,DISS	UG/L	2	4.50000	6.00000	3.00000
NICKEL	NI,TOTAL	UG/L	8	56.2500	100.000	50.0000
SILVER	AG,DISS	UG/L	2	2.00000	2.00000	2.00000
STRONTUM	SR,DISS	UG/L	2	2050.00	2600.00	1500.00
VANADIUM	V,DISS	UG/L	2	5.15000	8.00000	2.30000
ZINC	ZN,DISS	UG/L	2	15.0000	20.0000	9.99999
ZINC	ZN,TOT	UG/L	3	23.3333	40.0000	10.0000
TIN	SN,DISS	UG/L	2	18.5000	20.0000	17.0000
ALUMINUM	AL,TOT	UG/L	3	626.666	920.000	260.000
ALUMINUM	AL,DISS	UG/L	2	9.99999	10.0000	9.99999
GALLIUM	GA,DISS	UG/L	2	14.0000	20.0000	8.00000
GERMANUM	GE,DISS	UG/L	2	23.5000	30.0000	17.0000
LITHIUM	LI,DISS	UG/L	2	35.0000	40.0000	30.0000
LITHIUM	LI,TOT	UG/L	8	38.7500	60.0000	10.0000
SELENIUM	SE,DISS	UG/L	1	.000000	.000000	.000000
SELENIUM	SE,TOT	UG/L	8	.500000	1.00000	.000000
TITANIUM	TI,DISS	UG/L	2	16.0000	20.0000	12.0000
ZIRCONUM	ZR,DISS	UG/L	2	32.5000	35.0000	30.0000
BETA-D	AS CS137	PC/L	1	16.0000	16.0000	16.0000
BETA-S	AS CS137	PC/L	1	4.70000	4.70000	4.70000
RA-226-D	RADON MT	PC/L	1	.110000	.110000	.110000
U-NAT	DISOLVED	UG/L	1	10.0000	10.0000	10.0000
DISS SOL	SUM	MG/L	16	2736.44	4100.00	245.000
DISS SOL	TONS/DAY		16	45.1275	306.000	.390000
DISS SOL	TONS PER	ACRE-FT	16	3.72250	5.58000	.330000
TOTAL N	AS NO3	MG/L	16	5.03125	9.70000	1.80000
MERCURY	HG,DISS	UG/L	2	.050000	.100000	.000000
MERCURY	HG,TOTAL	UG/L	8	.137500	.600000	.000000
ALPHA-D	AS U-NAT	UG/L	1	47.0000	47.0000	47.0000
ALPHA-S	AS U-NAT	UG/L	1	1.10000	1.10000	1.10000
BETA-D	AS SR-Y-	90, PC/L	1	13.0000	13.0000	13.0000
BETA-S	AS SR-Y-	90, PC/L	1	4.20000	4.20000	4.20000

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SARPY CREEK NEAR HYSHAM, MT.
30103 MONTANA
090291

112WRD 02111204
0000 CLASS 00

			NUMBER	MEAN	MAXIMUM	MINIMUM
LAB	IDENT.	NUMBER	1	751822	751822	751822
WATER	TEMP	CENT	14	5.78571	23.0000	.000000
AIR	TEMP	CENT	10	9.79998	31.5000	-.499E+01
STREAM	FLOW,	INST-CFS	14	45.7042	387.000	.020000
TURB	JKSN	JTU	14	22.3571	100.000	3.00000
CNDUCTVY	AT 25C	MICROMHO	14	2382.36	4300.00	215.000
DO		MG/L	14	8.84285	11.0000	1.80000
DO	SATUR	PERCENT	14	76.7728	108.000	16.4000
BOD	5 DAY	MG/L	10	3.98999	12.0000	1.20000
PH		SU	14	8.17857	8.50000	7.60000
CO2		MG/L	14	7.42857	31.0000	.500000
T ALK	CACO3	MG/L	14	447.928	727.000	73.0000
HCO3 ION	HCO3	MG/L	14	539.786	886.000	89.0000
CO3 ION	CO3	MG/L	14	3.07143	30.0000	.000000
RESIDUE	DISS-105	C MG/L	1	2700.00	2700.00	2700.00
RESIDUE	TOT NFLT	MG/L	1	5.00000	5.00000	5.00000
TOTAL N	N	MG/L	14	1.03071	2.90000	.430000
ORG N	N	MG/L	14	.878572	2.50000	.400000
NH3-N	TOTAL	MG/L	14	.073571	.340000	.010000
TOT KJEL	N	MG/L	14	.948572	2.70000	.420000
NO2&NO3	N-TOTAL	MG/L	14	.085000	.460000	.000000
PHOS-TOT		MG/L P	14	.090714	.460000	.000000
TOT HARD	CACO3	MG/L	14	612.786	1300.00	78.0000
NC HARD	CACO3	MG/L	14	178.071	610.000	.000000
CALCIUM	CA,DISS	MG/L	14	86.7143	190.000	18.0000
MGNSIUM	MG,DISS	MG/L	14	96.9286	210.000	8.00000
SODIUM	NA,DISS	MG/L	14	362.928	880.000	14.0000
SODIUM	ADSBTION	RATIO	14	5.98571	10.0000	.600000
PERCENT	SODIUM	%	14	51.9286	65.0000	23.0000
PTSSIUM	K,DISS	MG/L	14	9.87143	14.0000	7.20000
CHLORIDE	CL	MG/L	14	13.8000	33.0000	3.10000
SULFATE	SO4-TOT	MG/L	14	917.428	2500.00	40.0000
FLUORIDE	F,DISS	MG/L	14	.335714	.500000	.100000
SILICA	DISOLVED	MG/L	14	8.27857	12.0000	.800000
ARSENIC	AS,DISS	UG/L	2	1.50000	2.00000	1.00000
ARSENIC	AS,TOT	UG/L	8	3.75000	11.0000	.000000
BARIUM	BA,DISS	UG/L	2	65.0000	70.0000	60.0000
BERYLIUM	BE,DISS	UG/L	2	4.99999	9.99999	.000000
BERYLIUM	BE,TOT	UG/L	8	7.50000	10.0000	.000000

			NUMBER	MEAN	MAXIMUM	MINIMUM
BISMUTH	BI,DISS	UG/L	2	18.0000	20.0000	16.0000
BORON	B,DISS	UG/L	14	362.857	680.000	110.000
CADMIUM	CD,DISS	UG/L	2	.499999	.999999	.000000
CADMIUM	CD,TOT	UG/L	8	12.5000	20.0000	.000000
CHROMIUM	CR,DISS	UG/L	2	4.99999	9.99999	.000000
CHROMIUM	CR,TOT	UG/L	8	5.62500	20.0000	.000000
COBALT	CO,DISS	UG/L	2	15.5000	16.0000	15.0000
COPPER	CU,DISS	UG/L	2	2.00000	3.00000	1.00000
COPPER	CU,TOT	UG/L	8	31.2500	90.0000	10.0000
IRON	FE,TOT	UG/L	8	2263.75	11000.0	140.000
IRON	FE,DISS	UG/L	14	135.000	410.000	10.0000
LEAD	PB,DISS	UG/L	2	2.00000	3.00000	.999999
LEAD	PB,TOT	UG/L	8	100.000	100.000	100.000
MANGNESE	MN	UG/L	8	838.750	6000.00	20.0000
MANGNESE	MN,DISS	UG/L	2	89.9999	130.000	50.0000
MOLY	MO,DISS	UG/L	2	3.50000	5.00000	2.00000
MOLY	MO,TOT	UG/L	8	2.50000	6.00000	1.00000
NICKEL	NI,DISS	UG/L	2	3.00000	5.00000	.999999
NICKEL	NI,TOTAL	UG/L	8	50.0000	100.000	.000000
SILVER	AG,DISS	UG/L	2	2.00000	2.00000	2.00000
STRONTUM	SR,DISS	UG/L	2	2000.00	2500.00	1500.00
VANADIUM	V,DISS	UG/L	2	4.95000	8.00000	1.90000
ZINC	ZN,DISS	UG/L	2	9.99999	10.0000	9.99999
ZINC	ZN,TOT	UG/L	4	57.0000	120.000	8.00000
TIN	SN,DISS	UG/L	2	15.5000	16.0000	15.0000
ALUMINUM	AL,TOT	UG/L	4	535.000	1500.00	110.000
ALUMINUM	AL,DISS	UG/L	2	5.00000	10.0000	.000000
GALLIUM	GA,DISS	UG/L	2	9.00000	10.0000	8.00000
GERMANUM	GE,DISS	UG/L	2	18.0000	20.0000	16.0000
LITHIUM	LI,DISS	UG/L	2	60.0000	80.0000	40.0000
LITHIUM	LI,TOT	UG/L	8	40.0000	70.0000	10.0000
SELENIUM	SE,DISS	UG/L	1	.000000	.000000	.000000
SELENIUM	SE,TOT	UG/L	8	.125000	1.00000	.000000
TITANIUM	TI,DISS	UG/L	2	15.5000	20.0000	11.0000
ZIRCONUM	ZR,DISS	UG/L	2	27.5000	35.0000	20.0000
BETA-D	AS CS137	PC/L	1	23.0000	23.0000	23.0000
BETA-S	AS CS137	PC/L	1	3.80000	3.80000	3.80000
RA-226-D	RADON MT	PC/L	1	.040000	.040000	.040000
U-NAT	DISOLVED	UG/L	1	9.00000	9.00000	9.00000
DISS SOL	SUM	MG/L	14	1766.00	4280.00	150.000
DISS SOL	TONS/DAY		14	37.7792	157.000	.230000
DISS SOL	TONS PER	ACRE-FT	14	2.40071	5.82000	.200000
TOTAL N	AS NO3	MG/L	14	4.57142	13.0000	1.90000
MERCURY	HG,DISS	UG/L	2	.050000	.100000	.000000
MERCURY	HG,TOTAL	UG/L	8	.087500	.300000	.000000
ALPHA-D	AS U-NAT	UG/L	1	38.0000	38.0000	38.0000
ALPHA-S	AS U-NAT	UG/L	1	.400000	.400000	.400000
BETA-D	AS SR-Y-	90, PC/L	1	20.0000	20.0000	20.0000
BETA-S	AS SR-Y-	90, PC/L	1	3.50000	3.50000	3.50000

CONCENTRATION LISTED KNOWN NOT TO CAUSE ADVERSE EFFECTS UNLESS SPECIFIED*

ELEMENTS

	Public H_2O Supply	Stock Usage	Irrigation Long Term	Freshwater Aquatic Life: effect	Freshwater Aquatic Life: no effect	US Average Concentration	Montana: Average	Montana: Range
Aluminum (Al)	1-5 a131	5 d309	1.0 a130	.07 a130	.05 d179	.074 c8	.2	<.1-2.8
Antimony (Sb)	-- a139			3.5 a139				
Arsenic (As)	.05 e	.2 d310	.10 d339	1.1 a141	1.0 a141	.043 c8	.025	<.001-.090
Barium (Ba)	1.0 d59		1.0 k19	12 a143	5 a142		<.1	<.1-.4
Beryllium (Be)	-- a148	-- a145	.10 d339	.15 a146	.011 a146	.0002 c8	<.005	<.005-.01
Boron (B)	5 d89	5.0 d310	.75 d339	5000 a148	2000 a148	.101 c8	.1	<.1-13
Bromine (Br)	-- a119			10 a148	1.0 a148			
Cadmium (Cd)	.01 d60	.05 d311	.01 d339	.0005 d180	.0004 d180	.0095 c8	.006	<.002-.005
Calcium (Ca)		1000 a151				57.1 d306	65.3	15-216
Cerium (Ce)	-- a187			.14 a157				
Chlorine (Cl)	2 a161		3.0 a162	.03 a162	.002 035			
Chromium (Cr)	.05 e	1.0 d311	.10 d339	1.2 a165	.05 d180	.0097 c8	<.02	<.02-.02
Cobalt (Co)	-- a166	1.0 d311	.05 d339	10 a167	1.0 a167	.001 d306	<.03	<.03-.03
Copper (Cu)	1.0 a168	.5 d312	.1 a171	.025 a171	.02 a171	.0138 d306	.01	<.01-.23
Gold (Au)	-- a188			.40 a193				
Iodine (I)						.046 d306		
Iron (Fe)	.3 a204	-- a136	5.0 d339	.2 a203		.044 d306	<.05	<.05-.29
Lanthanum (La)	-- a206	-- a206		.15 a206				
Lead (Pb)	.05 e	.1 d313	5.0 d339	.1 a208	.03 d181	.023 c8	<.05	<.05-.07
Lithium (Li)	5 a210		.075 d339					
Magnesium (Mg)	30-125 a211	500 a211	24 a211	300 a212		14.3 d306	17	<1-175
Manganese (Mn)	.05 a215	10 a215	.2 d339	2.2 a215	1.0 a215	.029 d306	<.01	<.01-.10
Mercury (Hg)	.002 e	.01 d314		.008 a218	.00005 d74			
Molybdenum (Mo)		-- a136	.01 d339	70 a221		.068 c8	.030	<.001-.299
Nickel (Ni)	1.0 d482		.20 d339	5 d181		.019 c8	<.02	<.02-.03
Oxygen (O_2)	a ≥ 4 a20				-- d181		10.2	7.4-22
Palladium (Pd)				7 a234				
Potassium (K)	340 a243			50 a243		4.3 d306	3.1	<.1-13
Radium (Ra)	-- a250					.05×10⁻⁹ a250		
Rubidium (Rb)				14 a253				
Selenium (Se)	.01 e	.05 d316	.02 d339	2 a254		.000016 d306	.004	<.002-.014
Silver (Ag)	.05 e	-- a254	.05 k19	.003 a257		.0026 c8	<.05	
Sodium (Na)		2000 a137		500 a259		55.1 d306	40.6	1.0-530
Strontium (Sr)	-- a274	-- a274	-- a274			.22 c8	.2	<.1-1.0
Sulfur (S)				10 a278				
Thallium (Tl)					.05 d256			
Thorium (Th)				.4 a286				
Tin (Sn)	-- a286	-- a286	40 a286	6.0 a287	1.2 a287			
Titanium (Ti)	-- a287	-- a287	12 a287	2.0 a287				
Tungsten (W)				110 a290				
Uranium (U)	.5-1.0 a291	-- a291		2.8 a292				
Vanadium (V)	-- a292	.1 d316	.10 d339	4.8 a292		.04 c8	.018	<.001-.16
Zinc (Zn)	5 a294	25 d317	2.0 d339	.01 a295	.003 a296		.03	<.01-.17
Zirconium (Zr)		-- a297		14 a298		.052 d306		

COMPOUNDS

	Public H_2O	Stock	Irrigation Long Term	Freshwater Aquatic Life: effect	Freshwater Aquatic Life: no effect	US Average Concentration	Montana: Average	Montana: Range
Acidity as $CaCO_3$	-- a126	170 a129		-- 940			134	57-300
Alkalinity as $CaCO_3$	-- d54	170 a129		-- 940				
Ammonia (NH_3)	.5 d55			.11 d187	.02 d187		.11	0-13
Carbonate (CO_3^{--})	20 a155			-- 940				
BiCarbonate (HCO_3^-)	150 a146		172 a146	-- 940		90 a147	158	61-500
Carbon Dioxide (CO_2)	-- a156				-- d133			1.2-13
Chloride (Cl^-)	250 a161	1500 a161	100 a161		-- a161	9 a161	10.9	<.5-74
Cyanide (CN)	.01 d482		.2 k19	.05 d190	.005 d190			
Fluoride (F^-)	1.4-2.4 e	1.0 a191	1.0 d339	2.3 a191	1.5 a191		.43	<.05-2.4
Hardness as $CaCO_3$	150 a23		70 a197		-- 914.1		191	63-1260
MBAS[3]	.5 d67		-- a199			<.1 d190		<.01-17
Nitrate (NO_3 as N)	10 e	100 d316	-- a225			.9 a225	.10	<.01-.69
Nitrite (NO_2 as N)	1 d73	10 d315	-- a226				<.01	<.01-.02
Oil and Grease	0 a25	30 a231	-- a231	.3 a96				
Phenol (C_6H_5OH)	.001 a240	1000 a240	50 a240	.079 d191				<.001-8.4
Phosphate (PO_4 as P)	50 a240	-	60 a241		.01 m	.087 d306	.013	<.001-.05
PCB[4]				.00001 d177	.000002 d177			
RSC[5]			1.25 meq/L k81					
Silica (SiO_2)	50 a255		10-50 a255		-- a255		8	1-32
SAR[6]			8 d335				1.2	.10-7.4
Sulfate ($SO_4^{=}$)	250 a276	500 a277	200 a277		-- a276	32 a276	130	<10-1254
Sulfide ($S^=$)	.2 a277			.017 d193	.002 d193			

PESTICIDES

	Public H_2O	Stock	Irrigation Long Term	Freshwater Aquatic Life: effect	Freshwater Aquatic Life: no effect	US Average Concentration	Montana: Average	Montana: Range
Endrin	.0002 e	4 mg/kg f131			2×10⁻⁶ d186			
Lindane	.004 e	88 mg/kg f133			2×10⁻⁵ d186			
Methoxychlor	.1 e	14 mg/kg f131			5×10⁻⁶ d186			
Toxaphene	.005 e	4 mg/kg f134	-- a390		1×10⁻⁵ d186			
DDT	.05 d77	35 mg/kg f140	-- a369		2×10⁻⁶ d186			
DDE		880 mg/kg f148						
2,4,D	.1 e	20 mg/kg f140	20 a366		1.0 g37			
2,4,5,-TP Silvex	.01 e				1.0 g37			
Aldrin	.001 d77	5 mg/kg f126			8×10⁻⁷ g37			
Dursban		82 mg/kg f213			6×10⁻⁵ g37			
Fenthion (Baytex)		200 mg/kg f214			6×10⁻⁷ g37			

PHYSICAL

	Public H_2O Supply	Stock Usage	Irrigation Long Term	Freshwater Aquatic Life: effect	Freshwater Aquatic Life: no effect	US Average Concentration	Montana: Average	Montana: Range
Color (units)	75 d63						7	<5-45
Conductance (umho/cm)			750 d335				531	128-2269
pH	5.0-9.0 d80		4.5-9.0 d332		6.5-8.5 d27		8.1	6.7-9.4
Residue (Nonfilterable) (TSS)[1]	a280		-- d332		25 d129			
Residue (filterable) (TDS)[2]	500 a89	2860 g134	500 d335				330	82-2361
Temperature	-- d89				-- d151		9.5	0-27
Turbidity (Units)	1-5 e				-- 974		325	7.5-22000
%Gas Saturation					110% d139			

BIOLOGICAL

CONCENTRATION EXPRESSED AS ORGANISMS PER 100 MILLITERS

	Public H_2O Supply	Stock Usage	Irrigation Long Term	Freshwater Aquatic Life: effect	Freshwater Aquatic Life: no effect	US Average Concentration	Montana: Average	Montana: Range
Total Coliforms	1 e				70 g37		235	0-4800
Fecal Coliforms							181	0-7000

PRELIMINARY DRAFT

EXPLANATIONS

.Letters and values following criteria indicate reference source and page number for criteria.
All values in mg/l unless indicated.
< less than; no. following indicates detection limit of Montana State Water Lab using normal procedure with no extraction
*Indicates the minimum concentration of a substance for the use specified
1 TSS=Total Suspended Solids; 2 TDS=Total Dissolved Solids; 3 MBAS=Methylene Blue Active Substance;
4 PCB=Polychlorinated Biphenyls; 5 RSC=Residual Sodium Carbonate; 6 SAR=Sodium Adsorption Ratio
--no concentration limits set on the parameter reference and pg. no. given for prose discussion

REFERENCES

a. McKee & Wolf (1963). Water Quality Criteria. The Resources Agency of California.
b. Goettl, Sinley, Davies (1973). Water Pollution Studies. Colorado Division of Wildlife
c. Kopp & Kroner (1967). Trace Metals in Waters of the United States. U. S. Dept. of Int.
d. Zucker, Dr. Alexander, Executive Director. (1972). Water Quality Criteria 1972. Environmental Protection Agency
e. National Interim Primary Drinking Water Standards.
f. Little, (1970). Water Quality Criteria Data Book Vol. 1: Organic Chemical Pollution of Fresh Water. Environ. Prot. Agency
g. Ray, Hurlon C. (1968). Report to Committee of Water Quality Criteria. U. S. Department of the Interior.
h. Richards (1969). Diagnosis and Improvement of Saline and Alkali Soils. U. S. Dept. of Ag.
i. Kemp, Little, Holoman & Darby (1973). Water Quality Criteria Data Book Vol 5: Effects of Chemicals of Aquatic Life. Environ. Prot. Agency.
j. Brungs (1973). Effects of Residual Chlorine on Aquatic Life. Jl. of Water Pollution Control Fed.: Oct. Vol. 45, No. 10.
k. Water Pollution Control Research Series 11050 FKE, December, 1969
L. Mechalas, Hekimian, Schinazi, & Dudley (1972) Water Qual. Criteria Data Book Vol. 4: An Investigation into Rec. Water Supply. Environ Prot. Agency.
m. Unpublished Trace Element Data from Water Quality Bureau Files
n. PCB in Water: A bibliography, Vol. 2 (1975). U. S. Dept. of Int. Office of Water Research and Technology
o. Water and Sewage Works, April, 1974.

15

SUMMARY OF WATER QUALITY CRITERIA
M. K. Botz and Dick Pedersen*

Values on this chart are concentrations that are not known to cause adverse environmental effects for the uses specified. The exception to this is the column which lists the lowest concentrations at which adverse biological effects have been observed for freshwater aquatic organisms. Superscript letters and numbers indicate the reference sources and page numbers for the criteria.

The chart shows average concentrations for the United States and the average and range of concentrations for Montana. The average concentrations for Montana are based on the three major rivers leaving Montana and the range is based on a review of typical data from 12 major streams in Montana.

Although concentrations on this chart are thought to be safe (except the adverse biological effect column), the effects of each substance depend on its interaction with other substances in solution. These effects can substantially enhance or reduce toxic effects when a combination of substances is present. For example, water hardness commonly influences the toxicity of many substances such as Be, Cd, Mo, Se, Zn. Substances in soft water typically are toxic in concentrations 5 to 75 times lower than in hard waters. Commonly, the hardness of water is not specified for toxicity tests; thus, no attempt was made to distinguish criteria for soft and hard waters. There is some information on the effects of hardness, however, and the chart user is referred to the referenced source. It also is important to recognize that these criteria are based on a limited amount of testing and additional testing may reveal adverse effects for some concentrations that are presently considered to be safe. The state of a substance also is important. For example, dissolved metals often are more toxic than are the same metals in a particulate state. Many bioassay tests do not report the physical-chemical state of the toxicant used. Where data are available for both suspended (particulate) and dissolved metals the dissolved concentrations were used.

Under aquatic life, the lowest concentration with no reported adverse effect is listed. Physical and chemical conditions and biological organisms tested can vary enormously; thus, the concentration listed may cause adverse effects under other conditions. Conversely, some organisms under some conditions may possible tolerate, without adverse effect, much higher concentrations of a substance than shown on this chart.

Also listed under aquatic life is a concentration at which an adverse effect was observed. A typical adverse effect is death of a portion of the test organisms. Commonly, fish are used for toxicity tests, but a wide variety of organisms can and have been used. Again, it is important to understand that concentrations less than those listed probably have adverse effects in many situations; however, with some organisms or other conditions, a higher concentration may not cause adverse effects.

Under aquatic life where effects are noted, the effect in all cases is mortality of the test organism. No attempt was made to list the mortality extent, organism involved, test period or other conditions. Chart users are referred to the referenced source.

Information and references used to compile this chart are listed and are probably the most commonly and widely used criteria. The search for suitable criteria was not extensive but was concentrated on those references thought to be the best overall criteria for waters in the United States.

Uses specified on this chart are the most common uses of water in most areas. Water quality requirements for recreation were considered since recreation is a common water use. It was found, however, that water suitable for other uses on this chart would be suitable for recreation. In cases where conflicting data from several sources were obtained concerning safe concentrations of a particular substance, the lowest concentration of that substance was selected.

Little or no criteria are available for some elements and their biological importance is poorly known. Elements not listed on this chart are:

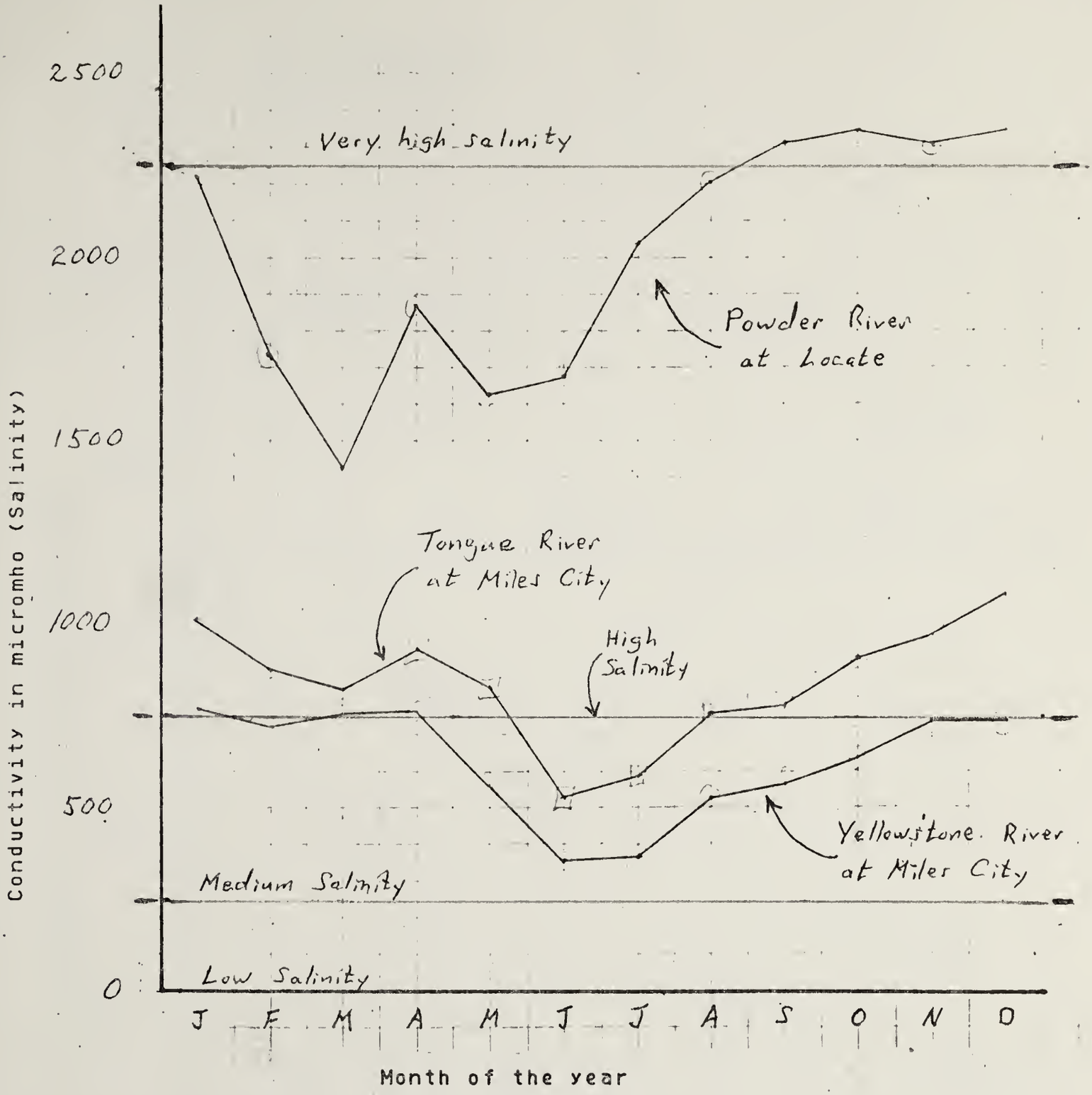
Actinum (Ac)	Indium (In)	Rhodium (Rh)
Astatine (At)	Iridium (Ir)	Ruthenium (Ru)
Bismuth (Bi)	Platinum (Pt)	Samarium (Sm)
Cesium (Cs)	Polonium (Po)	Scandium (Sc)
Dysprosium (Dy)	Praseodymium (Pr)	Tantalum (Ta)
Erbium (Er)	Promethium (Pm)	Technetium (Tc)
Europium (Eu)	Protactinium (Pa)	Tellurium (Te)
Francium (Fr)	Lutetium (Lu)	Terbium (Tb)
Gadolinium (Gd)	Neodymium (Nd)	Thulium (Tm)
Gallium (Ga)	Niobium (Nb)	Wolfram (see Tungsten)
Germanium (Ge)	Osmium (Os)	Ytterbium (Yb)
Hafnium (Hf)	Rhenium (Re)	Yttrium (Y)
Holmium (Ho)		

Headings used for this chart are somewhat inaccurate and were designed for convenience rather than scientific accuracy. For example, chloride (Cl^-) is listed as a compound whereas it is in fact typically an ion in solution. Similarly, hardness, SAR (sodium absorption ratio), and RSC (residual sodium carbonate) are not compounds but are conditions related to the water chemistry.

Mr. Tom Nickol, while a student at Carroll College in Helena, assisted in gathering much of the data shown on this chart.

PRELIMINARY DRAFT

*Water Quality Bureau, Montana Department of Health and Environmental Sciences, Helena, Montana 59601; December, 1976.



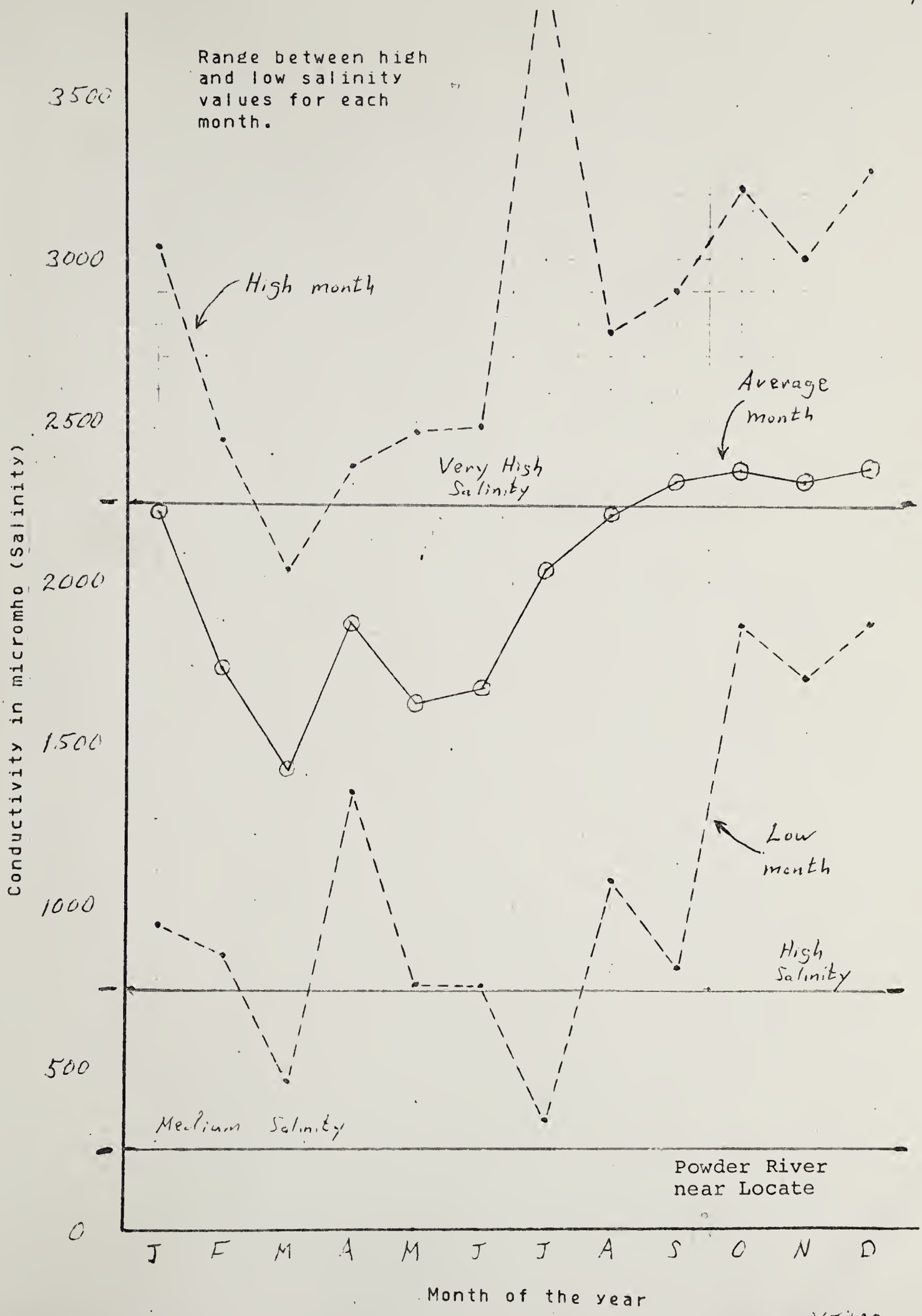
The average salinity, by month, compared to the categories developed by the U.S. Department of Agriculture.

MEDIUM: Should allow some leaching to occur.

HIGH: Use with salt tolerant crops and well drained soils.

VERY HIGH: Not suitable for irrigation under ordinary conditions. Water should be applied in an excess on well drained soils and with salt tolerant crops.

YTAPO


Range between high and low salinity values for each month.
3500
3000
2500
2000
1500
1000
500
0
Conductivity in micromho (Salinity)
High month
Average month
Very High Salinity
Low month
High Salinity
Medium Salinity
Powder River near Locate
J F M A M J J A S O N D
Month of the year

YTAPO